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CRITICAL THINKING SKILLS IN DIORAMA-BASED LEARNING FOR ENVIRONMENTAL AWARENESS

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ABSTRACT

The low environmental awareness of students and the suboptimal critical thinking skills indicate the need for learning innovations that can provide real and meaningful learning experiences. This study aims to determine the effect of mitigation-based diorama learning on critical thinking skills in fostering students' environmental awareness. This study uses a quantitative approach with a quasi-experimental method and employs a post-test only control group design. The research subjects consisted of fourth-grade students divided into experimental and control classes. The experimental class received mitigation diorama-based learning, while the control class used conventional learning. Data collection was conducted using a post-test instrument that measures critical thinking skills based on six indicators, namely interpretation, analysis, evaluation, inference, explanation, and self-regulation. The research instrument has met the criteria for validity and reliability. Data analysis was conducted using the Mann Whitney U test because the data from both groups were not normally distributed. The research results show that there is a significant difference between the experimental class and the control class with an Asymp. Sig. (2-tailed) value of 0.035 < 0.05. Additionally, the Effect Size value of 0.28 falls into the moderate category. The results indicate that diorama-based mitigation learning has a positive and significant impact on students' critical thinking skills and supports the development of environmental awareness. Thus, mitigation diorama learning can be one of the innovative learning alternatives in developing students' critical thinking skills and environmental awareness.

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INTRODUCTION

Environmental quality continues to decline, as evidenced by the public's still-low level of awareness and concern regarding environmental sustainability. According to (Nainggolan et al., 2023) poor environmental quality is caused by excessive human activities that disregard ecosystem balance. Ecosystem balance is essential for the survival of humans and

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other living beings (Dewi Syafitri Oktaviani et al., 2023). Disruption of the ecosystem's balance can accelerate environmental degradation (Eklou et al., 2023). This demonstrates that humans have a responsibility to preserve environmental quality. One approach to addressing this issue is to foster awareness and concern from an early age.

It is important for people to develop a sense of environmental awareness from an early age. Efforts to instill environmental awareness can be carried out through a learning process that is not only oriented toward the acquisition of knowledge but also toward the development of environmentally conscious attitudes and behaviors from an early age (Nurhidayah et al., 2026). According to (Ucar cabuk & İŞAL, 2023) a lack of environmental awareness instilled from an early age can lead to students having insufficient awareness of the importance of protecting the environment. Environmental awareness education for children is necessary because it builds understanding and positive attitudes toward the environment. If not addressed early on, this issue can have serious consequences for future generations (Karina et al., 2025). Therefore, learning that integrates environmental education is essential for developing students who possess the awareness, responsibility, and ability to protect and preserve the environment in a sustainable manner.

Although it is important to instill environmental awareness from an early age, in reality, students' level of environmental awareness is still not optimal. According to (Hilman et al., 2023) students' lack of sensitivity to environmental issues occurring in their surroundings underscores the need for instructional approaches that foster empathy and concern for the environment. Furthermore, (Widyapuraya et al., 2023) state that the lack of learning activities focused on developing critical thinking skills means students are not yet trained to analyze, evaluate, draw conclusions, or explain information in depth. Therefore, teaching and learning approaches are needed that are not only focused on mastering subject matter but also capable of developing critical thinking skills to foster students' environmental awareness.

This issue was also identified based on the results of preliminary observations conducted at MI Perwanida Blitar. The observation results indicate that students' environmental awareness has not yet developed optimally. This can be seen in the students' behavior, which does not yet fully demonstrate an awareness of the need to protect the environment—such as a lack of attention to classroom cleanliness and the continued occurrence of students littering. Furthermore, the learning process regarding environmental issues is still primarily conducted through the presentation of material, so students have not had many opportunities to directly observe, analyze, and evaluate environmental issues. These conditions indicate a need for instructional innovations that can provide authentic learning experiences while simultaneously developing students' critical thinking skills.

Critical thinking skills are an important ability to develop in the learning process because they help students understand, evaluate, and make decisions based on the information they receive. According to Facione (1998), critical thinking skills encompass the activities of analysis, evaluation, and drawing conclusions (inference) that help a person assess information objectively, identify hidden assumptions, evaluate arguments rationally, and draw conclusions based on logical evidence (Nurkasanah et al., 2025). This indicates that critical thinking skills are essential so that students do not merely passively receive information but are also able to process and apply it appropriately in various learning situations and in daily life.

Although the urgency of developing critical thinking skills has been widely recognized in the field of education, its implementation at various educational levels including elementary school (SD) still faces various challenges that need to be addressed effectively. Research indicates that traditional teaching methods tend to provide insufficient opportunities for students to develop critical thinking skills (Nurhayani et al., 2025). Therefore, innovative teaching approaches are needed to improve the quality of education and prepare students to face future challenges.

One alternative that can be used is the mitigation diorama as a learning tool. A mitigation diorama is a three-dimensional miniature model used to represent real-life scenes or situations related to environmental conditions, whether illustrating environmental damage caused by human activities to abiotic components or damage caused by natural disasters By using dioramas, students not only receive material in an abstract form but can also observe, identify, and analyze environmental issues more concretely (Qadri et al., 2024). Through this process, students have the opportunity to actively engage in learning activities, which supports the development of higher-order thinking skills, including critical thinking.

Based on various theoretical and empirical studies, the researchers hypothesize that learning based on mitigation dioramas can influence critical thinking skills in fostering an attitude of environmental concern. Critical thinking helps

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students analyze problems, evaluate them, and determine appropriate solutions (Shvardak et al., 2025). Meanwhile, environmental awareness helps students understand the relationship between humans and nature, think critically, solve environmental problems, and make sustainable decisions (Alotaibi et al., 2025). Learning through mitigation dioramas can influence critical thinking, thereby fostering environmental awareness. This study aims to determine the effect of using mitigation dioramas on critical thinking skills in fostering an attitude of environmental awareness.

METHOD

This study employs a quantitative research design, as the data collected consists of numerical values and is analyzed using statistical techniques. Quantitative research is an empirical research approach in which the data used are numerical or measurable (A'yun & Wardani, 2025). This study emphasizes the process of collecting and analyzing numerical data (Wardani & Sulistyawati, 2023). This study employs a quasi-experimental method with a "post-test only control group" design. A quasi-experimental design is an experimental research approach that uses a control group but has limitations in controlling all external variables that may influence the research process in fourth-grade classrooms (Sugiyono, 2010). The experimental class is the one that receives the treatment in the form of the application of a mitigation diorama, while the control class does not receive this treatment. The treatment utilized mitigation diorama-based learning; the detailed stages are shown in the following table:

Table 1. Diorama Based Leaning Syntax

Stages	Activity	Description
Orientation	The teacher introduces a diorama on environmental mitigation, and the students observe environmental issues.	In class
Exploration	The teacher explains the causes, impacts, and mitigation efforts for environmental threats using a diorama.	In class
Discussion	Students discuss using worksheets to analyze problems and solutions.	Group discussion
Presentation	One group presents the results of their discussion, while another group offers feedback.	in class
Evaluation	Teachers and students summarize and evaluate the learning outcomes.	In class
Follow up	Students practice environmentally conscious behavior in their daily lives.	Inside and outside the classroom

Source: Researcher, 2026

The instruments used were multiple-choice questions, while data collection was conducted through a post-test administered at the end of the learning process, specifically assessing critical thinking and environmental awareness. The assessment of critical thinking skills and environmental awareness was conducted through a post-test designed based on the indicators of critical thinking skills according to Facione (2015) (Samudra et al., 2025). The assessment refers to six indicators, namely interpretation, analysis, evaluation, inference, explanation, and self-regulation. Furthermore, the measurement of environmental awareness was developed based on three main aspects—knowledge, attitudes, and skills—adapted from Farmer et al. (2019) and Kim (2019) (Wibowo et al., 2024). All instruments were found to be valid based on the results of the Product-Moment correlation test and reliable based on Cronbach's Alpha coefficients. The results of the instrument validity test are presented in Table 2, while the results of the reliability test are presented in Table 3.

Table 2. Recapitulation of Validity Test Results

No.	Question Item	Calculation	r-tabel	Remarks
1.	Question 1	0,456	0,381	Valid
2.	Question 2	0,424	0,381	Valid

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3.	Question 3	0,478	0,381	Valid
4.	Question 4	0,448	0,381	Valid
5.	Question 5	0,542	0,381	Valid
6.	Question 6	0,404	0,381	Valid
7.	Question 7	0,524	0,381	Valid
8.	Question 8	0,478	0,381	Valid
9.	Question 9	0,524	0,381	Valid
10.	Question 10	0,467	0,381	Valid
11.	Question 11	0,404	0,381	Valid
12.	Question 12	0,428	0,381	Valid
13.	Question 13	0,473	0,381	Valid
14.	Question 14	0,400	0,381	Valid
15.	Question 15	0,415	0,381	Valid
16.	Question 16	0,411	0,381	Valid
17.	Question 17	0,448	0,381	Valid
18.	Question 18	0,388	0,381	Valid
19.	Question 19	0,448	0,381	Valid
20.	Question 20	0,397	0,381	Valid
21.	Question 21	0,435	0,381	Valid
22.	Question 22	0,400	0,381	Valid
23.	Question 23	0,571	0,381	Valid
24.	Question 24	0,423	0,381	Valid
25.	Question 25	0,444	0,381	Valid

Source: Researcher, 2026

The validity test results showed that all 25 items were deemed valid. This was indicated by calculated r values ranging from 0.388 to 0.571, while the critical r value was 0.381. Thus, all calculated *r* values were greater than the critical *r* value (0.381), meaning that all items met the validity criteria. Consequently, all 25 items can be used as a data collection instrument without the need to eliminate any items. After all items were deemed valid based on the validity test results, the next step was to conduct a reliability test to determine the level of consistency and the performance of the research instrument in measuring the variables under study.

Table 3. Instrument Reliability Test Result

Number of Question Item	Cronbach's Alpha	Minimum Limits	Remarks
27	0,834	0,700	Reliable (High reliability)

Source: Researcher, 2026

The reliability test results in Table 3 show that the research instrument has a Cronbach's Alpha value of 0.834. This value exceeds the minimum reliability threshold of 0.600, so the instrument can be deemed reliable with a high level of reliability. This value indicates good internal consistency among the items in the instrument, meaning the instrument can produce consistent measurements of the IPAS learning outcome variable. With this level of reliability, the research instrument is considered to be highly reliable in generating research data. Furthermore, the reliability test results reinforce the validity test conducted previously, in which all items were deemed valid. Thus, the research instrument meets the criteria for validity and reliability and is suitable for use as a data collection tool in this study.

Sosioedukasi
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RESULT AND DISCUSSION

The research results were obtained from the post-test IPAS learning outcomes of students in the experimental and control classes and were then presented descriptively in a table 4.

Table 4. Data Description

	Experimental Class Post-Test	**Control Class Post-Test**
N	27	28
Mean	90,81	88,29
Median	92,00	88,00
Modus	96	92
Std. Deviation	4,683	3,760
Minimum	84	80
Maximum	96	92

Source: Researcher, 2026

Based on the table, there was a difference in IPAS learning outcomes between the experimental and control classes. This can be seen from the fact that the experimental class's average score was higher than that of the control class, at 90.81 and 88.29, respectively. The median score for the experimental class was 92.00, while that for the control class was 88.00. The mode for the experimental class was 96 and for the control class 92, with a standard deviation of 4.683 for the experimental class and 3.760 for the control class. The lowest score obtained by a student in the experimental class was 84, and in the control class 80. Meanwhile, the highest score obtained by a student in the experimental class was 96, while in the control class it was 92.

Before testing the hypotheses, we first conducted the prerequisite tests for the analysis, including the normality test. The results of the normality test are presented as follows.

Table 5. Normality Test Result (Shapiro-Wilk)

Tests of Normality

		Shapiro-Wilk		
	Class	Statistic	df	Sig.
Student Learning Outcomes	Experimental Class Post-Test	.838	27	<.001
	Control Class Post-Test	.814	28	<.001

Source: Researcher's Data, 2026

Based on the table above, it is evident that the Sig. value in the Shapiro-Wilk test for the experimental class's post-test is < 0.001, which is less than 0.05. Therefore, in accordance with the decision criteria for the Shapiro-Wilk normality test, it can be concluded that the experimental class's post-test data are not normally distributed. Meanwhile, the Sig. value in the Shapiro-Wilk test for the Control Class's post-test is also < 0.001, which is less than 0.05. Therefore, in accordance with the decision criteria of the Shapiro-Wilk normality test, it can be concluded that the Control Class's post-test data are not normally distributed. Thus, since the data from both groups are non-normally distributed, the inferential statistical analysis for the difference test is continued using the non-parametric Mann-Whitney U test.

Table 6. Mann-Whitney U Test

	Student Learning Outcomes
Mann-Whitney U	257. 500
Wilcoxon W	663.500
Z	-2. 106

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Volume 15 No. 4 Desember 2026 https://ejournal.unibabwi.ac.id/index.php/sosioedukasi/index

Asymp. Sig (2-tailed)	.035

Source: Researcher's Data, 2026

Based on the table of Mann-Whitney U test results above, the Asymp. Sig. (2-tailed) value of 0.035 is less than 0.05. Therefore, based on the decision criteria for the Mann-Whitney U test, it can be concluded that the mean critical thinking skills achieved through mitigation diorama-based learning are higher than the mean critical thinking skills achieved through conventional learning, indicating that students' critical thinking skills are better when using mitigation diorama-based learning than when using conventional learning.

In addition, the effect size was determined based on a Z-score of -2.106. Based on the effect size calculation ($r = Z/\sqrt{N}$), the value of r was approximately 0.28, which falls into the moderate category. This indicates that the intervention administered to the experimental class had a sufficiently strong and practically meaningful effect on improving students' critical thinking skills—not merely a statistically significant one. Thus, the implementation of mitigation diorama-based learning in this study can serve as an effective alternative learning method to improve students' abilities.

Research data shows that the implementation of mitigation diorama-based learning can have a positive impact on the development of critical thinking skills. Critical thinking skills contribute to an increase in students' environmental awareness. These findings are consistent with research (Wulandari et al., 2025) which indicates that the use of instructional media addressing environmental issues can stimulate students to develop critical thinking skills. Improved critical thinking skills help foster environmental awareness and concern. The use of learning media that integrates environmental issues provides students with the opportunity to understand and evaluate various solutions and determine the appropriate course of action. This process not only develops students' cognitive abilities but also fosters an awareness of the importance of protecting the environment.

Critical thinking skills in this study were analyzed based on six indicators: interpretation, analysis, evaluation, inference, explanation, and self-regulation. According to (Fakhriyah et al., 2026) diorama-based learning can improve critical thinking skills. Meanwhile, according to (Rizal et al., 2026) improved critical thinking skills can foster students' concern for the environment. These findings are supported by (Fabio & Manoti, 2026) who demonstrated a positive relationship between critical thinking skills and pro-environmental behaviors. Thus, critical thinking skills can be one of the factors that foster students' environmental awareness.

The interpretation indicator can enhance environmental awareness by fostering students' ability to understand and make sense of information regarding environmental issues. This understanding can help students recognize the conditions and impacts of environmental damage, thereby fostering an awareness of the importance of environmental conservation. In line with this (Hasibuan et al., 2025) found a positive relationship between critical thinking skills and digital ecoliteracy, indicating that critical thinking skills can support students in understanding and responding to various pieces of information and issues related to the environment.

Understanding information about environmental issues must be supported by analytical skills, specifically the ability to identify the cause-and-effect relationships involved (Imelda Rohmawati & Prastiwi, 2026). Analytical skills can foster environmental awareness because they enable students to understand the causes and impacts of environmental damage. This awareness, in turn, can help cultivate environmental concern among students. These findings, supported by (Aripin et al., 2024) indicate that teaching analytical critical thinking in problem-based learning can increase students' awareness of environmental issues.

The next indicator is evaluation; the ability to evaluate can contribute to the development of environmental awareness because it enables students to assess information, conditions, and actions based on rational considerations (Purwantini et al., 2025). This ability helps students weigh the various consequences of an action before making a decision. (Sindiani-Bsoul et al., 2026) explain that environmental attitudes reflect an individual's evaluation of preferences and views regarding the environment, which in turn can influence behavior in either preserving or damaging the environment. These findings suggest that the process of evaluating the environment can play a crucial role in the development of pro-environmental attitudes and behaviors.

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The ability to evaluate information and assess alternative courses of action regarding environmental issues is related to the ability to make inferences and draw conclusions based on available evidence. Inferential skills enable students to connect various pieces of information and evidence about environmental conditions to draw conclusions and predict possible outcomes (Khasanah et al., 2025). This is supported by (Ayu et al., 2025) who identify inference as a key component of critical thinking in environmental education, particularly in processing information to address ecological problems.

Explanatory indicators play a role in strengthening students' understanding of environmental issues through the process of presenting the reasons and evidence underlying that understanding. This process helps students explain the relationships between causes, conditions, and impacts, so that their understanding is not merely informative but also fosters a sense of responsibility toward the environment (Ningthias et al., 2024). (He et al., 2026) explain that explanation involves the use of evidence and reasoning to support a claim, thereby building a meaningful understanding of the issues.

The understanding gained through this explanation must be supported by indicators of self-regulation. Self-regulation plays a role in guiding and controlling actions through planning, monitoring, and commitment to established goals. Through self-regulation, students can control their habits and consider the impact of their actions, thereby consistently demonstrating environmental awareness. This is supported by (Khastini et al., 2024) he understanding gained through this explanation must be supported by indicators of self-regulation. Self-regulation plays a role in guiding and controlling actions through planning, monitoring, and commitment to established goals.

CONCLUSION

The results of the study indicate that the implementation of diorama-based learning on disaster mitigation has a positive and significant effect on students' critical thinking skills in fostering an attitude of environmental concern. Based on the results of statistical analysis using the Mann-Whitney U test, an Asymp. Sig. (2-tailed) value of 0.035 (less than 0.05) was obtained, proving a significant difference between the experimental class and the control class. In addition, the effect size test yielded a value of 0.28, which falls into the moderate category. This indicates that the use of mitigation dioramas has a positive impact on critical thinking skills, thereby fostering an attitude of environmental concern compared to conventional learning. The implementation of innovative learning through mitigation dioramas has proven effective in enhancing critical thinking skills, which in turn fosters an attitude of environmental concern among students. A limitation of this study is that it examined only the variables of critical thinking and environmental awareness. Therefore, further research is needed to determine the influence of other variables on environmental awareness in Mitigation Diorama-based learning, such as creative thinking skills and collaboration skills.

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Volume 15 No. 4 Desember 2026 https://ejournal.unibabwi.ac.id/index.php/sosioedukasi/index

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